alternative method for screening drugs for neurodegenerative disease as well as studying molecular biophysics of protein aggregations, and further extended to explore other protein conformational diseases.

2105-Pos Board B835
Novel Biosensor for Point of Care Medical Diagnostics
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Point Of Care (POC) diagnostic devices enable clinicians to provide rapid diagnoses at the time and location of care. Such POC devices are particularly relevant in world regions where access to laboratory facilities is limited or unavailable. In these applications, portability, economy, and versatility are paramount. Much of the recent research in biosensors, however, has been focused on high selectivity and high sensitivity. This focus has led to devices which require lengthy amplification schemes and/or require specialized and costly detection equipment. In addition, many of the most sensitive or selective biosensing paradigms are applicable to only a limited range of analytes. In the realm of POC diagnostics, there remains a particular need for rapid, inexpensive sensors which are portable and generalizable to a wide range of analytes. In this work, we have designed a novel biosensor which meets these needs. This sensor consists of an array of micro-posts embedded within a microfluidic channel. The post array is saturated with an aqueous solution containing well-dispersed 1-um superparamagnetic microbeads. Both the beads and the posts are chemically functionalized such that the presence of a targeted analyte will cause irreversible binding of beads to posts, which results in a detectable modulation in optical transmission. In an initial proof-of-principle, we have biotinylated both the beads and posts such that they bind in the presence of streptavidin; however, with appropriate functionalization the sensor could be designed to detect any of a wide variety of analytes with varying degrees of specificity. Our current fabrication methods would facilitate multi-channel detection from a single biological sample. While this biosensing mechanism is not as sensitive as many in development today, its generalizability and ease of use would make it ideal for point-of-care medical diagnostics in areas without access to diagnostic laboratories.

2106-Pos Board B836
Transparent Multi-Suction Electrode Arrays for *in vitro* Neural Network Investigations
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Large-scale multisite electrophysiology recordings with high temporal resolution are essential to discover neural circuitry and elucidate their structure-function relationship. We contribute to this effort by combining multielectrode arrays (MEAs) with through pore arrays in quartz substrates to create multi-suction electrode arrays. The MEA allows for multisite extracellular recordings from neural tissue while the through pore array permits suction to be applied to the tissue to form more intimate contact with the electrodes. We successfully recorded from mouse hippocampi, mouse retina, and leech segmental ganglia. Hippocampus and retina tissue show at least a 50% increase in S/N and twofold increase in detectable spikes following suction. (Interestingly, spiking activity and S/N of spikes in leech ganglia mostly do not increase after applied suction, suggesting sources deeper in the tissue.) Finally, we demonstrate optical imaging through the transparent substrate to visualize the neurons at the electrode interface simultaneously with electrophysiology recordings. This technology will facilitate the combination of optical-based measurements such as voltage-sensitive dye imaging with multisite electrophysiological recordings with high temporal resolution of neuronal networks in a wide range of vertebrate and invertebrate preparations, at the single spike level.

2107-Pos Board B837
Polydiacetylene (PDA) Vesicle Based Colorimetric Biosensor for Detection of Genetically Modified (GM) Crops
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Food crisis is one of the most important issues around the world. With a population explosion, Harvesting crops in a classical manner no longer keep up with population explosion. In addition, agricultural pesticide and insect pest give rise to environmental problems. Recent advances in biotechnology ameliorates both issues by inserting productivity amplifying gene and pesticide neutralizing protein encoded gene, maximizing crop productivity and producing pesticide resistant crop, so-called genetically modified (GM) crops. Due to the bioethical issues and potential risk to human, people are concerned about the GM crops, thus many countries make regulations for the GM crops. In order to regulate GM crops, we need fast, accurate and simple methods to the GM crops. In this study we have devised a biosensor to detect phosphinothricin acetyltransferase (PAT) protein that makes GM crops resistant to herbicides. In order to detect PAT protein, anti-PAT antibody was conjugated to polydiacetylene (PDA) vesicles. PDA vesicles have unique colorimetric characteristics, changing their color from blue to red upon external stimuli. Anti-PAT antibody conjugated PDA vesicles are subsequently encapsulated within hydrogel matrix to maximize the intensity of color change, resulting in the sensitivity enhancement of the sensor. Our biosensor could detect as low as the 20nM of PAT protein. Furthermore we developed a microfluidic device to automate the production of uniform sized immunohydrogel beads. Our simple biosensor can be identified by the naked eyes without the aid of special instrument or expertise, widening the potential applications in the area of point-of-care testing (POCT).

2108-Pos Board B838
Paper-Based Integrated Diagnostic Device for Nucleic Acid Detection of HIV from Blood
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Paper materials with good biocompatibility, porous structures, hydrophilic property, capillary effect, low non-specific binding, and multi-modification have been widely applied in diagnostic devices for environmental monitoring, food safety, and healthcare. However, utilizing these properties on one paper chip for quantitative measurement of nucleic acid amplification from blood is a big challenge for point-of-care (POC) device. Here we report an integrative paper-based molecular diagnostic device (IPMD) with the capability of fast plasma separation and sensitive nucleic acid (NA) detection of HIV from blood. The IPMD is composed of a highly efficient plasma generation membrane over a rapid flow nitrocellulose layer for plasma separation, HIV NA collection, amplification, and fluorescence read-out. 100 μL of whole blood sample is separated on-chip within 5 min. The hydrophilic, porous, capillary properties of nitrocellulose are beneficial to pre-store all the chemical components of nucleic acid amplification by a lyophilization process. HIV NA with a limit-of-detection of 10 copies is achieved by analyzing the fluorescence intensity of the nitrocellulose layer after NA amplification for 20 min. These results suggest that our IMPD platform can promote the development of POC devices for global healthcare and personalized medicine.

2109-Pos Board B839
Rapid Detection of Methicillin-Resistant Staphylococcus Aureus using Bubble-Free Microfluidic PCR
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Methicillin-resistant Staphylococcus aureus (MRSA) is the most common hospital-acquired infection and resistant to certain drugs; therefore, reliable PCR detection of MRSA is critical for early prevention of disease spread and the effective treatment of infections. The major problems of microfluidic PCR are water evaporation, loss of reagents, and inconsistent optical path-length due to random bubble generations during the thermal cycling. We report a bubble-free microfluidic PCR for the detection of MRSA. In order to avoid the bubble generation, we utilized polyethylene-based microfluidic devices since it has low gas permeability. The proposed polyethylene microfluidic PCR also offers a uniform heat distribution without the amplification inhibition by a temperature drop in the aqueous nucleic acid sample. The polyethylene layer was spin-coated over PDMS channel for effective hybrid integration of two different functions of polymeric materials (i.e. degasing pump for PDMS and polyethylene for uniform PCR and optical path-length). Consequently overall sample loss such as PCR reagent and nucleic acid was almost eliminated by bubble-free condition. The detection limit of mecA which is methicillin-resistance gene was found to be 6.4 x 102 copies of MRSA genomic DNA by the end-point fluorescence analysis for approximately 30 min reaction. The bubble-free multiplexed microfluidic MRSA PCR array will benefit for rapid detection and drug resistance determination effectively.

2110-Pos Board B840
Simple Detection of Amyloid-Beta Peptide for a Diagnosis of Alzheimer's Disease using Photo-Sensitive Fet with Optical Filtering Layer
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Alzheimer's disease (AD) is a degenerative brain disease, and there are some limitations for an early diagnosis because the main cause and a remedy for